

AMENDMENTS TO THE DRAWINGS:

The attached sheet of drawings includes changes to FIG. 10. This sheet, which includes FIGs. 9 and 10, replaces the original sheet including these same figures. In FIG. 10, reference number "133" and an associated lead line are added, and reference number "145" and an associated lead line are deleted.

Attachments: Replacement Sheet
Annotated Sheet Showing Changes

REMARKS

By this reply, Claims 1, 2, 4, 10-13, 15, 16 and 27-29 have been amended. Claims 1-30 are pending in the application. Claims 22-25 stand withdrawn from consideration. The specification and drawings have been amended. Favorable consideration is respectfully requested in view of the following remarks.

Objections to Drawings and Specification

The Official Action objects to the drawings under 37 C.F.R. § 1.83(a) for the reasons stated at pages 2-6 of the Official Action.

At numbered point (2) of the Official Action, it is asserted that reference character "131" has been used to designate the "upper portion," "threads" and "external threads." To address this objection, Applicants propose to amend Figure 10 to add the reference number 133 to indicate the location of the "upper portion." The specification is amended to be consistent with revised Figure 10.

At numbered point (3) of the Official Action, it is asserted that reference characters "128," "130," "131" and "136" have been used to designate the fastener member 128. As described at paragraph [0041] of the specification, the fastener member 128 includes a shaft 130 and external threads 131. In FIG. 10, the reference number 128 indicates the fastener member generally, while reference numbers 130 and 131 indicate specific portions of the fastener member 128. As described at paragraph [0041], the aperture 136 is in the backing plate 22, but is not part of the fastener member. Applicants submit that FIG. 10 is acceptable.

At numbered point (4) of the Official Action, it is asserted that reference number 145 is not mentioned in the description. Applicants propose to amend

Figure 10 to delete reference number 145 and its associated lead line to address this objection. This amendment to Figure 10 also addresses the objection stated at numbered point (5) of the Official Action.

At numbered point (6) of the Official Action, it is asserted that reference character "12" has been used to designate the "second member," "first part" and "inner electrode member." At numbered point (7) of the Official Action, it is asserted that reference character "14" has been used to designate the "outer electrode member" and the "second member." At numbered point (8) of the Official Action, it is asserted that reference character "18" has been used to designate the "backing plate," "first member" and "second part." At numbered point (9) of the Official Action, it is asserted that reference character "22" has been used to designate the "backing ring," "first member" and "second part." At numbered point (11) of the Official Action, it is asserted that reference character "24" has been used to designate the "top plate" and "the third part."

To fully address each of these objections, the specification has been amended, and the claims have been amended to be consistent with the specification. More particularly, the specification has been amended at paragraph [0021] to describe that the upper electrode is also referred to as a "second member"; the specification has been amended at paragraph [0024] to describe that the backing member is also referred to as a "first member"; and the specification has been amended at paragraph [0025] to describe that the top plate is also referred to as a "third member." The claims have been amended to change: "the first part" to "the second member"; "the second part" to "the first member"; and "the third part" to "the

third member.” For simplicity, the claims, as amended, recite first, second and third members, but do not also recite first, second and third parts.

Lastly, at numbered point (10) of the Official Action, it is asserted that the reference character “21” has been used to designate the “top surface” and the “second surface.” The specification describes the “top surface 21” (or “second surface”) of the backing plate 18 depicted in Figures 1 and 6. The “top surface” and “second surface” are alternative names for the same surface. As such, the reference number “21” is not used to designate different surfaces, but designates the same surface.

Applicants submit the amendments to the drawings and specification fully address the objections set forth in the Official Action. Accordingly, withdrawal of the objections is respectfully requested.

First Rejection Under 35 U.S.C. § 103

Claims 1-21 and 27-30 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,818,096 to Barnes et al. (“Barnes”) in view of U.S. Patent No. 5,766,344 to Ishida et al. (“Ishida”) for the reasons stated at pages 7-16 of the final Official Action. The rejection is respectfully traversed.

Claim 1, as amended, recites a component of a plasma processing apparatus, which comprises “a first member bonded to a second member, the first member including a plurality of through apertures having a first portion and a second portion wider than the first portion; and a plurality of first fastener members each mounted in an aperture of the first member, each first fastener member including a head configured to prevent rotation of the first fastener members relative to the first

member, the head having a bearing surface facing a surface that at least partially defines the second portion of the aperture” (emphasis added).

Referring to Figure 1 of Barnes, the Official Action states that Barnes discloses a component comprising a “first member” 7 (i.e., the lid 7) attached to a “second member” 1, 8 (i.e., upper plate 1 and outer ring 8) and including a plurality of through apertures, “T-shaped hole for 22” (i.e., the attachment bolt 22), and a plurality of “first fastener members (dark-shaded members 22)” each mounted in an aperture. Applicants submit that Barnes does not suggest the combination of features recited in Claim 1.

Figure 1 of Barnes is a cross-sectional view of the plasma reactor electrode structure. As such, Figure 1 does not show the actual shape of the attachment bolt 22, much less that it includes a “head” configured to prevent its rotation relative to the lid 7. In fact, the cross-section shown in Figure 1 of Barnes is consistent with the attachment bolt having a circular horizontal cross-section, for example, which is not a shape that would prevent rotation of the attachment bolt 22 relative to the lid 7. Barnes also includes no description regarding the shape of the hole or the “head” of the attachment bolt 22. Accordingly, Barnes does not disclose or suggest an electrode structure including, *inter alia*, the features of “a plurality of first fastener members each mounted in an aperture of the first member, each first fastener member including a head configured to prevent rotation of the first fastener members relative to the first member, the head having a bearing surface facing a surface that at least partially defines the second portion of the aperture” (emphasis added), as recited in Claim 1.

Ishida does not provide the required suggestion or motivation to modify Barnes' electrode structure to include each and every feature recited in Claim 1. The Official Action also asserts that it would have been obvious to add Ishida's "first fastener members" (i.e., the heat conductor 109) to Barnes' apparatus. The Official Action asserts that Ishida's "first fastener members" 109 (i.e., heat conductors 109) are "bonded" with an elastomer (i.e., O-rings 31a shown in Figure 3). See the Official Action at page 15, next-to-last paragraph. Applicants respectfully disagree.

As shown in Figure 2 of Ishida, the heat conductor 109 is a plate or grid having rectangular spaces 109a between the frame 109b and crossing bars 109c. Thread holes 33a are formed in the crossing bars 109c. O-rings 31a are placed in the thread holes 33a. First bolts 30a are received in the thread holes 33a to attach the temperature controlling plate 106 to the heat conductor 109.

The Office Action references Figures 3 and 4 of Ishida. Figure 3 of Ishida shows a cross-section through the heat conductor 109 at the location of a thread hole 33a. Figure 4 of Ishida shows a cross-section through the heat conductor 109 at the location of a hole 32b. The portions of the heat conductor 109 shown in Figures 3 and 4 of Ishida are part of the plate structure, i.e., integral with the remainder of the heat conductor 109 depicted in Figure 2. The portions of the heat conductor 109 shown in Figures 3 and 4 of Ishida are surrounded by the space 109a. The portions are not mounted in an aperture of a first member, as recited in Claim 1. Ishida does not suggest that the portions of the heat conductor 109 shown in Figures 3 and 4 include a head configured to prevent rotation of those portions relative to a first member. In stark contrast, the portions of the heat conductor 109 shown in Figure 3 and 4 are part of the plate heat conductor 109.

Ishida does not provide the required suggestion or motivation to modify Barnes' electrode structure by adding Ishida's plate heat conductor 109. Ishida's heat conductor 109 does not include a plurality of first fastener members, each of which is mounted in a respective aperture of a first member. The portions of the first conductor 109 shown in Figures 3 and 4 of Ishida are not mounted in an aperture of a first member, but are surrounded by gas pressure equalizing space 109. As such, even if Barnes' electrode structure was modified by adding Ishida's plate heat conductor 109, the resulting structure still would not include at least the features of "a plurality of first fastener members each mounted in an aperture of the first member, each first fastener member including a head configured to prevent rotation of the first fastener members relative to the first member," as recited in Claim 1.

Moreover, the Official Action provides no reasons as to why it would have been obvious, in view of the applied combination of references, to modify Barnes' electrode structure to bond the lid 7 ("first member") to the upper plate 1 and outer ring 8 ("second member"). Absent any motivation for modifying Barnes' electrode structure to result in the component recited in Claim 1, including, *inter alia*, the features of "a first member bonded to a second member, the first member including a plurality of through apertures having a first portion and a second portion wider than the first portion," (emphasis added), the component recited in Claim 1 is patentable over the applied combination of references for this additional reason.

Dependent Claims 2-9 are also patentable over the combination of Barnes and Ishida for at least the same reasons as those discussed above with respect to Claim 1. Moreover, these dependent claims recite additional combinations of features that are neither disclosed nor suggested by the applied combination of

references. For example, Claim 2, as amended, recites that “the first fastener members are T-nuts having a T-shape and internal threads” (emphasis added). The Official Action considers the attachment bolt 22 to be a “first fastener member,” as recited in Claim 1. Figure 1 does not show that the attachment bolt 22 has a T-shape and internal threads.

As another example, Claim 3 recites that “the surface that at least partially defines the second portion of the aperture is a second bearing surface and the bearing surface of each of the first fastener members is bonded with an elastomer to the second bearing surface.” The Official Action asserts that Ishida discloses “first fastener members” 109 (i.e., heat conductors 109) “bonded” with an “elastomer” 31a (i.e., O-ring 31a). Ishida’s heat conductor 109 is not bonded to the temperature controlling plate 106 by the O-rings 31a. Rather, the O-rings 31a form a gas seal between the plate 106 and heat conductor 109 when these plates are fastened to each other by bolts 30a. The O-rings 31a do not bond (i.e., join) the plate 106 and heat conductor 109 together; rather, these elements are held together by the bolts 30a. Thus, Ishida provides no suggestion or motivation to modify Barnes to result in the component recited in Claim 3 for these additional reasons.

Claim 4, as amended, recites “a temperature-controlled top plate on the first member, adjacent the first portion of the apertures of the first member, and including a plurality of through openings each aligned with a respective aperture in the first member; and a plurality of second fastener members each engaged with a respective first fastener member to secure the first member to the top plate” (emphasis added). As recited in Claim 1 from which Claim 4 depends, the second portions of the apertures are wider than the first portions. In the exemplary

embodiment of the claimed component shown in Figure 3, the top plate 24 is adjacent the narrow portion of the aperture 36.

At page 9, point (v), the Official Action asserts that Barnes discloses a temperature-controlled "top plate" 7. However, as discussed above, the Official Action also asserts that Barnes' lid 7 is a "first member." The component recited in Claim 4 patentably distinguishes over the combination of Barnes and Ishida despite this inconsistent interpretation of Barnes. Claim 4 recites that the temperature-controlled top plate is on the first member and adjacent the narrower first portion of the apertures of the first member. According to Claim 4, the top plate is a separate part of the component from the first member. To the extent that Barnes' lid 7 has been asserted to be a "first member," as claimed, then Barnes does not also disclose the recited "temperature-controlled top plate" adjacent the lid 7.

Claim 6 recites the features of "each of the first fastener members includes a non-circular shaped head" (emphasis added). Barnes does not disclose or suggest a plurality of "first fastening members" having a non-circular shaped head configured to prevent rotation of the first fastener member relative to the first member. Ishida fails to cure the deficiencies of Barnes.

Claims 10-16 are also patentable over the applied references. Independent Claim 10, as amended, recites "a second member including an attachment surface and an exposed surface adapted to be exposed to an interior of a plasma processing chamber; a first member including a first surface spaced from a second surface, the first surface being bonded to the attachment surface of the second member, the first member including axially extending apertures extending between the first surface and the second surface, each of the apertures including a first portion opening in the

first surface and a second portion opening in the second surface, the first portion being wider in a transverse direction than the second portion" (emphasis added).

In an exemplary embodiment, the second member can be a showerhead electrode and the first member can be a backing plate, as recited in Claim 12. As shown in Figures 1 and 6, the backing plate has a bottom surface (or "first surface") 19 and a top surface (or "second surface") 21. The bottom surface 19 is bonded to the top surface (or "attachment surface") 16 of the electrode member 12. Figure 3 shows a portion 13 of the electrode attached to a portion 22 of the backing plate. As shown, an aperture 36 is formed in the portion 22 of the backing plate. A fastener member 38 is located in the wider "second portion" of the aperture 36, which opens at the bottom surface (or "second surface") of the portion 22 of the backing plate.

The combination of Barnes and Ishida does not suggest the component recited in Claim 10. Barnes' structure does not include a first member including apertures having a first portion and a wider second portion opening at a first surface of the first member, where the first surface is bonded to an attachment surface of a second member, as recited in Claim 10.

As understood, the Official Action acknowledges that Barnes does not disclose a first part (protective plate 3) bonded to a second part 2 (lower plate 2), and that the second part 2 includes axially extending apertures 4 (pins 4) which include a first portion opening at the lowest surface of lower plate 2 and a second portion opening at the top surface of lower plate 2. See the Official Action at numbered point (5) at pages 12-13.

Applicants submit that Ishida, at the least, provides no motivation to modify the opening that receives the pins 4 such that the opening has a first portion wider in a transverse direction than a second portion, as recited in Claim 10.

Dependent Claims 11-16 are also patentable over the applied references for at least the same reasons as those for Claim 10. Moreover, these dependent claims recite additional combinations of features that are not suggested by the applied references. For example, Claims 13 and 15, as amended, recite that the fastener members are T-nuts having a T-shape. As discussed above, neither Barnes nor Ishida suggests T-nuts having a T-shape.

Independent Claim 17 recites a showerhead electrode assembly for a plasma processing apparatus, which comprises, *inter alia*, a silicon electrode having gas injection openings; a graphite backing member secured to the silicon electrode, the backing member including a plurality of through apertures each having a first portion and a second portion wider than the first portion; a top plate including a plurality of through openings each of which is aligned with a respective aperture in the backing member; a plurality of first fastener members, each first fastener member being mounted in a respective aperture of the backing member, the first fastener member including a bearing surface facing a surface at least partially defining the second portion of the apertures; and a second fastener member engaged with each first fastener member to secure the backing member to the top plate. The applied references fail to suggest the showerhead electrode assembly recited in Claim 17.

The claimed showerhead electrode assembly comprises a silicon electrode having gas injection openings. For example, the embodiment of the claimed assembly shown in FIG. 1 includes an inner electrode member 12 including a

plurality of gas injection openings adapted to inject process gas into a plasma processing chamber.

The Official Action asserts that Barnes discloses an "electrode" 7 (i.e., lid 7) and a "top plate" 7 (i.e., lid 7); i.e., that the same lid 7 is both a top plate and an electrode. Applicants submit that this interpretation of Barnes is improper. Furthermore, Claim 17 recites that the backing member is secured to (i) the silicon electrode and (ii) the top plate; i.e., the silicon electrode and top plate are separate parts of the assembly. To the extent that Barnes' lid 7 has been considered to be an "electrode," Barnes' apparatus does not also include a "top plate," as claimed. Moreover, Barnes's lid 7 does not include gas injection openings, as does the silicon electrode recited in Claim 17. The combination of Barnes and Ishida does not suggest modifying Barnes' electrode structure to replace the lid 7, which provides cooling of the electrode structure, with a silicon electrode having gas injection openings.

Barnes also does not suggest "a graphite backing member secured to the silicon electrode, the backing member including a plurality of through apertures each having a first portion and a second portion wider than the first portion" (emphasis added), as recited in Claim 17. To the extent that Barnes' upper plate 1 has been considered to be a "backing member," Barnes does not disclose that the upper plate 1 includes a plurality of through apertures, each having a first portion and a second portion wider than the first portion, as recited in Claim 17. Ishida does not suggest modifying Barnes' "backing member" 1 to include a plurality of through apertures each having a first portion and a second portion wider than the first portion, as recited in Claim 17.

For at least the foregoing reasons, the combination of Barnes and Ishida does not suggest the showerhead electrode assembly recited in Claim 17, which is patentable over the applied references.

Dependent Claims 18-21, 27, 29 and 30 are also patentable over the applied references for at least the same reasons as those discussed with respect to Claim 17. Moreover, these dependent claims recite additional combinations of features that are not suggested by the applied references. For example, Claim 19 recites the features of “the second portion of each aperture [of the graphite backing plate] is configured to prevent rotation of the first fastener member relative to the backing member.” Claim 27 recites that the T-nuts are T-shaped. Neither Barnes nor Ishida suggests such apertures, or such T-shaped T-nuts.

Claim 20 includes the features of “the silicon electrode comprises an inner member and a segmented outer member, and the backing member comprises a backing plate secured to the inner member and a backing ring secured to the outer member” (emphasis added). In contrast, neither Barnes nor Ishida suggests such a multi-piece silicon electrode secured to a multi-piece backing member.

Therefore, withdrawal of the rejection is respectfully requested.

Second Rejection Under 35 U.S.C. § 103

Claim 26 stands rejected under 35 U.S.C. § 103(a) over Barnes and Ishida in view of U.S. Patent No. 5,681,135 to Simonson for the reasons stated at page 16 of the final Official Action. The rejection is respectfully traversed.

Simonson has been cited as allegedly curing the deficiencies of Barnes and Ishida with respect to Claim 26. Applicants submit that Simonson, at the least, also

does not disclose or suggest the second member including a plurality of through apertures having a first portion and a second portion wider than the first portion, and a plurality of first fastener members including a head configured to prevent rotation of the first fastener members relative to the second member. Thus, the component recited in Claim 26 is also patentable.

Therefore, withdrawal of the rejection is respectfully requested.

Conclusion

For the foregoing reasons, allowance of the application is respectfully requested. If there are any questions concerning this response, the Examiner is respectfully requested to contact the undersigned at the number given below.

Respectfully submitted,

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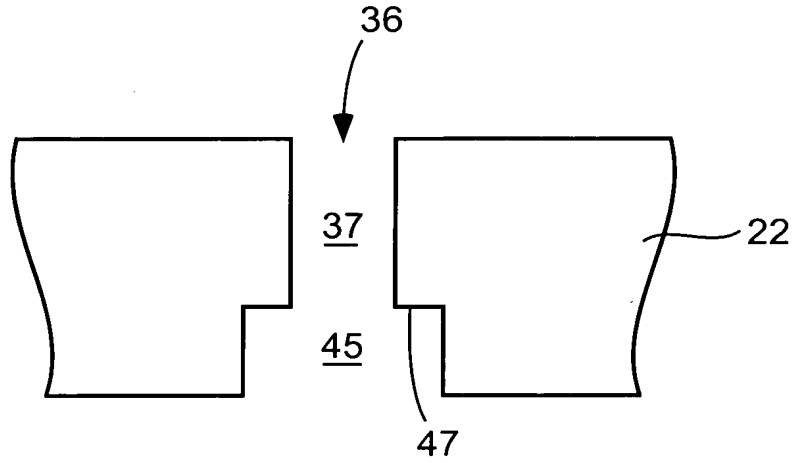


FIG. 9

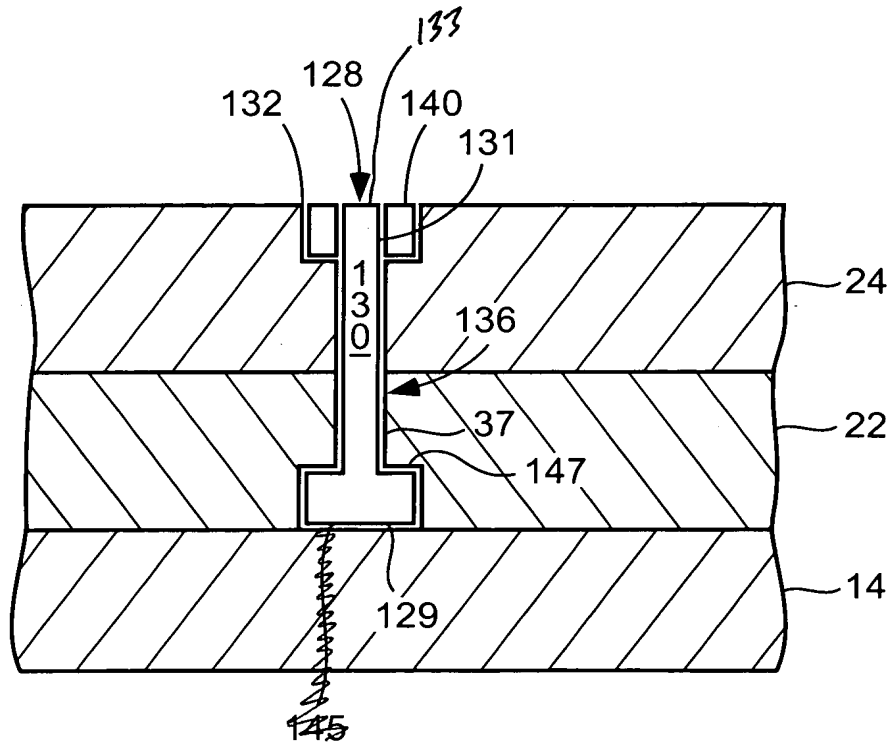


FIG. 10